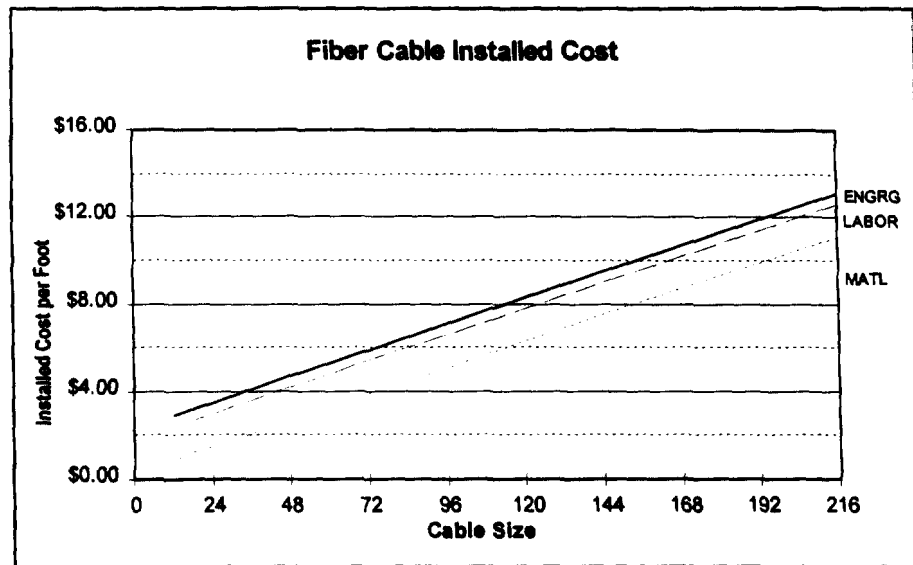


Placing Engineering and Direct Labor are estimated at \$2.00 per foot, consisting of \$0.50 in engineering per foot, plus \$1.50 direct labor per foot. These estimates were provided by a team of Outside Plant Engineering and Construction experts.

The following chart represents the default values used in the model.



#### 4.4.14. Number of Strands per ADM

**Definition:** The number of interoffice fiber strands connected to the ADM in each wire center. At least four per ADM are required around the ring.

**Default Value:**

Number of Strands per ADM
4

**Support:** This is the standard number of strands required by an ADM. It provides for redundant transmission in both directions around the interoffice fiber ring.

#### 4.4.15. Interoffice Structure Percentages

**Definition:** The relative amounts of different structure types supporting interoffice transmission facilities. Aerial cable is attached to telephone poles or buildings, buried cable is laid directly in the earth, and underground cable runs through underground conduit. Aerial and buried percentages are entered by the user; the underground fraction is then computed.

**Default Values:**

Structure Percentages		
Aerial %	Buried %	Underground %
20%	60%	20%

**Support:** These are average figures that reflect the judgment of a team of outside plant experts regarding the appropriate mix of density zones applicable to interoffice transmission facilities.

#### 4.4.16. Transport Placement

**Definition:** The cost of fiber cable structures used in the interoffice transmission system.

**Default Values:**

Transport Placement, per foot	
Buried	Conduit
\$1.77	\$16.40

**Support:** Structures closer to the central office are normally shared with feeder cable. Additional structures at the end of feeder routes may be required to complete an interoffice transport path. Since distances farther from the central office normally involve lower density zones, average structure costs appropriate for lower density zones are reflected in the default values. A default value for Buried representing the lower density zones is used, while a conservatively higher value is used for Conduit, representing the default value expected in a 850-2,550 line per square mile density zone.

#### 4.4.17. Buried Sheath Addition

**Definition:** The cost of dual sheathing for additional mechanical protection of fiber interoffice transport cable.

**Default Value:**

Buried Sheath Addition
\$0.20 per foot

**Support:** *{NOTE: The discussion in Section 3.2.3. [Fiber Feeder] is reproduced here for ease of use.}*

Incremental cost for mechanical sheath protection on fiber optic cable is a constant per foot, rather than the ratio factor used for copper cable, because fiber sheath is approximately ½ inch in diameter, regardless of the number of fiber strands contained in the sheath. The incremental per foot cost was estimated by a team of experienced outside plant experts who have purchased millions of feet of fiber optic cable.

#### 4.4.18. Interoffice Conduit, Cost and Number of Tubes

**Definition:** The cost per foot for interoffice fiber cable conduit, and the number of spare tubes (conduit) placed per route.

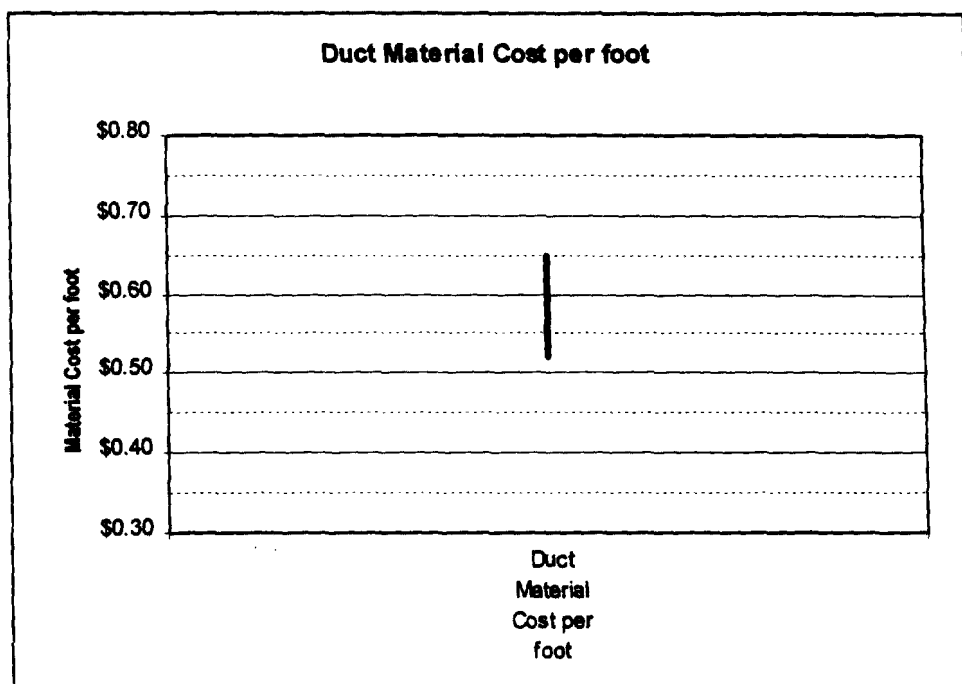
**Default Values:**

Interoffice Conduit, Cost and Number of Tubes	
Cost	Spare Tubes per Route
\$0.60 per foot	1

**Support:** {NOTE: The discussions in Sections 2.4.3. and 2.4.4. [Distribution] are reproduced here for ease of use.}

Conduit Cost per foot:

Several suppliers were contacted for material prices. Results are shown below.



The labor to place conduit in trenches is included in the cost of the trench, not in the conduit cost.

Under the Model's assumptions, a relatively few copper cables serving short distances (e.g., less than 9,000 ft. feeder cable length), and one or more fiber cables to serve longer distances, will be needed. Since the number of cables in each of the four feeder routes is relatively small, the predominant cost is that of the trench, plus the material cost of a few additional 4" PVC conduit pipes. No additional allowance is necessary for stabilizing the conduit in the trench.

Spare Tubes per Route:

"A major advantage of using conduits is the ability to reuse cable spaces without costly excavation by removing smaller, older cables and replacing them with larger cables or fiber facilities. Some companies reserve vacant ducts for maintenance purposes."<sup>30</sup> Version 4.0 of the Hatfield Model provides one spare maintenance duct (as a default) in each conduit run.

#### 4.4.19. Pullbox Spacing

**Definition:** Spacing between pullboxes in the interoffice portion of the network.

<sup>30</sup> BOC Notes on the LEC Networks - 1994, Bellcore, p. 12-42.

**Default Value:**

Pullbox Spacing
2,000 feet

**Support:** *{NOTE: The discussion in Section 3.2.2. [Feeder] is reproduced here for ease of use.}*

Unlike copper manhole spacing, the spacing for fiber pullboxes is based on the practice of coiling spare fiber (slack) within pullboxes to facilitate repair in the event the cable is cut or otherwise impacted. Fiber feeder pullbox spacing is not a function of the cable reel lengths, but rather a function of length of cable placed. The standard practice during the cable placement process is to provide for 5 percent excess cable to facilitate subsurface relocation, lessen potential damage from impact on cable, or provide for ease of cable splicing when cable is cut or damaged.<sup>31</sup> It is common practice for outside plant engineers to require approximately 2 slack boxes per mile.

#### **4.4.20. Pullbox Investment**

**Definition:** Investment per fiber pullbox in the interoffice portion of the network.

**Default Value:**

Pullbox Investment
\$500

**Support:** *{NOTE: The discussion in Section 3.7. [Fiber Feeder] is reproduced here for ease of use.}*

The information was received verbally from a Vice President of PenCell Corporation at their Supercom '96 booth. He stated a price of approximately \$280 for one of their larger boxes, without a large corporate purchase discount. Including installation, HM 4.0 uses a default value of \$500.

#### **4.4.21. Pole Spacing, Interoffice**

**Definition:** Spacing between poles supporting aerial interoffice fiber cable.

**Default Value:**

Pole Spacing, Interoffice
150 feet

**Support:** This is a representative figure accounting for the mix of density zones applicable to interoffice transmission facilities.

#### **4.4.22. Interoffice Pole Material and Labor**

**Definition:** The installed cost of a 40' Class 4 treated southern pine pole.

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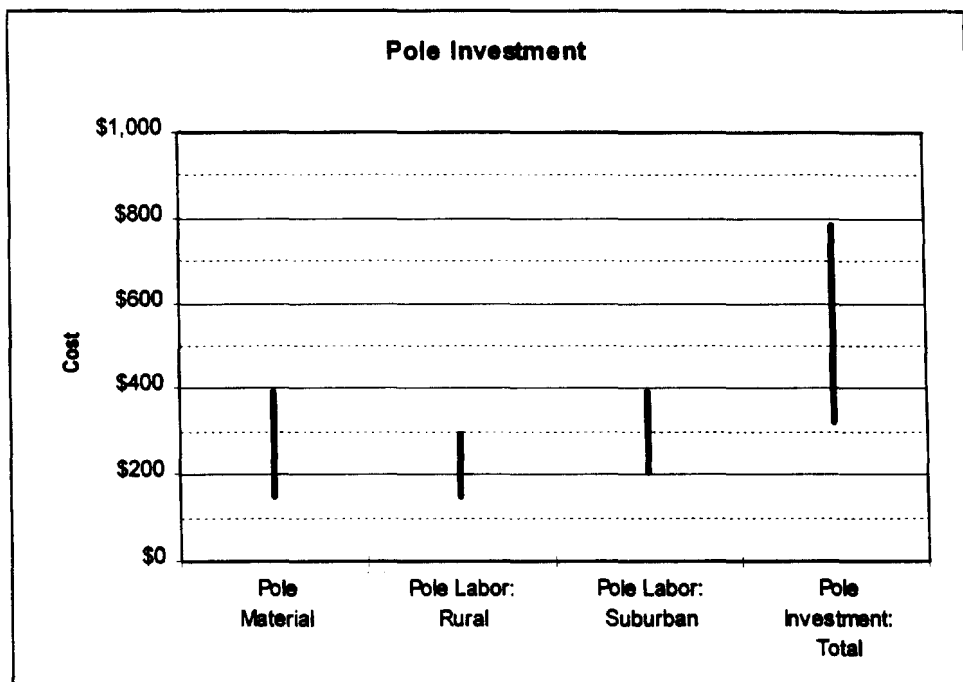
<sup>31</sup> *Cable Construction Manual, 4<sup>th</sup> Edition, CommScope, p. 75.*

**Default Values:**

Pole Investment	
Materials	\$201
Labor	\$216
Total	\$417

**Support:** {NOTE: The discussion in Section 2.4.1. [Distribution] is reproduced here for ease of use.}

Pole investment is a function of the material and labor costs of placing a pole. Costs include periodic down-guys and anchors. Utility poles can be purchased and installed by employees of ILECs, but are frequently placed by contractors. Several sources revealed the following information on prices.



The exempt material load on direct labor includes ancillary material not considered by FCC Part 32 as a unit of plant. That includes items such as downguys and anchors that are already included in the pole placement labor cost. The steel strand run between poles is likewise an exempt material item, charged to the aerial cable account. The cost of steel strands is not included in the cost of poles; it is included in the installed cost of aerial cable.

#### 4.4.23. Fraction of Interoffice Structure Common with Feeder

**Definition:** The percentage of structure supporting interoffice transport facilities that is also shared by feeder facilities, expressed as a fraction of the smaller of the feeder and interoffice investment in each of the three types of facilities (i.e., aerial, buried and underground are treated separately).

**Default Value:**

Fraction of Interoffice Structure Common with Feeder
.75

**Support:** Interoffice transport facilities will almost always follow feeder routes which radiate from each central office. Typically only a small distance between adjacent wire centers is not traversed by a feeder route; for this distance, structure is appropriately assigned exclusively to interoffice transport. In the opinion of a team of outside plant engineers, the additional structure required exclusively for interoffice transport is no more than 25 percent of the distance. Therefore, 75 percent of the interoffice route is assumed by the HM 4.0 to be shared with feeder cables.

#### 4.4.24. Interoffice Structure Sharing Fraction

**Definition:** The fraction of investment in interoffice poles and trenching that is assigned to LECs. The remainder is attributed to other utilities/carriers

**Default Values:**

Fraction of Interoffice Structure Assigned to Telephone		
Aerial	Buried	Underground
.33	.33	.33

**Support:** The structure sharing with other utilities covered by this parameter involves the portion of interoffice structure that is not shared with feeder cable. Sharing with other utilities is assumed to include at least two other occupants of the structure. Candidates for sharing include electrical power, CATV, competitive long distance carriers, competitive local access providers, municipal services and others. See also Appendix B.

## 4.5. TRANSMISSION PARAMETERS

### 4.5.1. Operator Traffic Fraction

**Definition:** Fraction of traffic that requires operator assistance. This assistance can be automated or manual (see Operator Intervention Fraction in the Operator Systems section below)

**Default Value:**

Operator Traffic Fraction
0.02

**Support:** Industry experience and expertise of Hatfield Associates.

### 4.5.2. Total Interoffice Traffic Fraction

**Definition:** The fraction of all calls that are completed on a switch other than the originating switch, as opposed to calls completed within a single switch.

**Default Value:**

Total Interoffice Traffic Fraction
0.65

**Support:** According to *Engineering and Operations in the Bell System*, Table 4-5, p. 125, the most recent information source found to date, the percentage of calls that are interoffice calls ranges from 34 percent for rural areas to 69 percent for urban areas. Assuming weightings according to the typical number of lines per wire center for each environment (urban, suburban, rural), these figures suggest an overall interoffice traffic fraction of approximately 65 percent.

### 4.5.3. Maximum Trunk Occupancy, CCS

**Definition:** The maximum utilization of a trunk during the busy hour.

**Default Value:**

Maximum Trunk Occupancy, CCS
27.5

**Support:** AT&T Capacity Cost Study.<sup>32</sup>

### 4.5.4. Trunk Port Investment, per End

**Definition:** Per trunk equivalent investment in switch trunk port at each end of a trunk.

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<sup>32</sup> Blake, et al., "A Study of AT&T's Competitors' Capacity to Absorb Rapid Demand Growth," p.4.

Default Value:

Trunk Investment, per end
\$100

**Support:** AT&T Capacity Cost Study.<sup>33</sup> Hatfield Associates judgment is that \$100 is for the switch port itself.

#### 4.5.5. Direct-Routed Fraction of Local Interoffice Traffic

**Definition:** The amount of local interoffice traffic that is directly routed between originating and terminating end offices as opposed to being routed via a tandem switch.

Default Value:

Direct-Routed Fraction of Local Interoffice
0.98

**Support:** The direct routed fraction of local interoffice is based on data filed by the LECs in response to an FCC data request issued in Docket 80-286: *In the Matter of Amendment of Part 36 of the Commission's Rules and Establishment of a Joint Board*, Docket 80-286, Order, December 1, 1994, 9 FCC Rcd 7962 (1994). See Universal Service Fund Data Request, File 1 of 4, page 8 of 11, 9 FCC Rcd 7962, 7976.

#### 4.5.6. Tandem-Routed Fraction of Total IntraLATA Toll Traffic

**Definition:** Fraction intraLATA toll calls that are routed through a tandem.

Default Value:

Tandem-Routed Fraction of Total IntraLATA Toll Traffic
0.2

**Support:** The tandem routed fraction of total intraLATA toll traffic is based on data filed by the LECs in response to an FCC data request issued in Docket 80-286: *In the Matter of Amendment of Part 36 of the Commission's Rules and Establishment of a Joint Board*, Docket 80-286, Order, December 1, 1994, 9 FCC Rcd 7962 (1994). See Universal Service Fund Data Request, File 1 of 4, page 8 of 11, 9 FCC Rcd 7962, 7976.

#### 4.5.7. Tandem-Routed Fraction of Total InterLATA Traffic

**Definition:** Fraction of interLATA (IXC access) calls that are routed through a tandem instead of directly to the IXC.

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<sup>33</sup> Blake, et al., "A Study of AT&T's Competitors' Capacity to Absorb Rapid Demand Growth," p. 7.

**Default Value:**

Tandem-Routed Fraction of Total InterLATA Traffic
0.2

**Support:** The tandem routed fraction of total interLATA traffic is based on data filed by the LECs in response to an FCC data request issued in Docket 80-286: *In the Matter of Amendment of Part 36 of the Commission's Rules and Establishment of a Joint Board*, Docket 80-286, Order, December 1, 1994, 9 FCC Rcd 7962 (1994). See Universal Service Fund Data Request, File 1 of 4, page 8 of 11, 9 FCC Rcd 7962, 7976.

#### **4.5.8. POPs per Tandem Location**

**Definition:** The number of IXC points of presence requiring an entrance facility, per LEC tandem.

**Default Value:**

POPs per Tandem Location
5

**Support:** An assumption that envisions POPs for three principal IXCs plus two smaller carriers associated with each LEC tandem.

## 4.6. TANDEM SWITCHING

### 4.6.1. Real Time Limit, BHCA

**Definition:** The maximum number of BHCA a tandem switch can process.

**Default Value:**

Real Time Limit, BHCA
750,000

**Support:** Industry experience and expertise of Hatfield Associates. These numbers are well within the range of the BHCA limitations NORTEL supplies in its Web site. See 4.1.1.

### 4.6.2. Port Limit, Trunks

**Definition:** The maximum number of trunks that can be terminated on a tandem switch.

**Default Value:**

Port Limit, Trunks
100,000

**Support:** AT&T Updated Capacity Cost Study.<sup>34</sup>

### 4.6.3. Tandem Common Equipment Investment

**Definition:** The amount of investment in common equipment for a large tandem switch. Common Equipment is the hardware and software that is present in the tandem in addition to the trunk terminations themselves. The cost of a tandem is estimated by the HM as the cost of common equipment plus an investment per trunk terminated on the tandem.

**Default Value:**

Tandem Common Equipment Investment
\$1,000,000

**Support:** AT&T Capacity Cost Study.<sup>35</sup>

### 4.6.4. Maximum Trunk Fill (Port Occupancy)

**Definition:** The fraction of the maximum number of trunk ports on a tandem switch that can be utilized.

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<sup>34</sup> Brand, T.L., Hallas, G.A., et al., "An Updated Study of AT&T's Competitors' Capacity to Absorb Rapid Demand Growth," April 19, 1995, p. 9.

<sup>35</sup> Blake, et. al., "A Study of AT&T's Competitors' Capacity to Absorb Rapid Demand Growth," p.9.

**Default Value:**

Maximum Trunk Fill (port occupancy)
0.90

**Support:** This is a Hatfield Associates estimate, which is used in lieu of forward looking alternatives from public sources or ILECs. It is based on consultations with AT&T and MCI subject matter experts.

#### **4.6.5. Maximum Tandem Real Time Occupancy**

**Definition:** The fraction of the total capacity (expresses as the real time limit, BHCA) a tandem switch is allowed to carry before an additional switch is provided.

**Default Value:**

Maximum Tandem Real Time Occupancy
0.9

**Support:** Bell Communications Research, *LATA Switching Systems Generic Requirements*, Section 17: Traffic Capacity and Environment, TR-TSY-000517, Issue 3, March 1989, figure 17.5-1, p. 17-24.

#### **4.6.6. Tandem Common Equipment Intercept Factor**

**Definition:** The multiplier of the common equipment investment input that gives the common equipment cost for the smallest tandem switch, allowing scaling of tandem switching investment according to trunk requirements.

**Default Value:**

Tandem Common Equipment Intercept Factor
0.50

**Support:** Value selected to allow tandem common equipment investment to range from \$500,000 to \$1,000,000 which is the appropriate range based on expertise of Hatfield Associates.

#### **4.6.7. Entrance Facility Distance from Serving Wire Center & IXC POP**

**Definition:** Average length of trunks connecting an IXC POP with the wire center that serves it.

**Default Value:**

Entrance Facility Distance from Serving Wire Center & IXC POP
0.5 miles

**Support:** Value selected in recognition of the fact that IXCs typically locate POPs close to the serving wire center to avoid long cable runs.

## 4.7. SIGNALING

### 4.7.1. STP Link Capacity

**Definition:** The maximum number of signaling links that can be terminated on a given STP pair.

**Default Value:**

STP Link Capacity
720

**Support:** AT&T Updated Capacity Cost Study.<sup>36</sup>

### 4.7.2. STP Maximum Fill

**Definition:** The fraction of maximum links (as stated by the STP link capacity input) that the model assumes can be utilized before it adds another STP pair.

**Default Value:**

STP Maximum Fill
0.80

**Support:** The STP maximum fill factor is based on Hatfield Associates engineering judgment and is consistent with maximum link/port fill levels throughout HM 4.0.

### 4.7.3. STP Maximum Common Equipment Investment, per Pair

**Definition:** The cost to purchase and install a pair of maximum-sized STPs.

**Default Value:**

STP Maximum Common Equipment Investment, per pair
\$5,000,000

**Support:** AT&T Updated Capacity Cost Study.<sup>37</sup>

### 4.7.4. STP Minimum Common Equipment Investment, per Pair

**Definition:** The minimum investment for a minimum-capacity STP, i.e.: the fixed investment for an STP pair that serves a minimum number of links.

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<sup>36</sup> Brand, et al., "An Updated Study of AT&T's Competitors' Capacity to Absorb Rapid Demand Growth," p. 26.

<sup>37</sup> Brand, et al., "An Updated Study of AT&T's Competitors' Capacity to Absorb Rapid Demand Growth," p. 26.

**Default Value:**

STP Minimum Common Equipment Investment, per pair
\$1,000,000

**Support:** It is necessary to allow the scaling of STP common equipment for smaller STPs that in some configuration are sufficient for local exchange carriers. The minimum STP common equipment investment cost is Hatfield Associates' judgment of the lower end of the range of common equipment investment.

#### 4.7.5. Link Termination, Both Ends

**Definition:** The investment required for the transmission equipment that terminates both ends of an SS7 signaling link.

**Default Value:**

Link Termination, Both Ends
\$900

**Support:** AT&T Updated Capacity Cost Study.<sup>38</sup>

#### 4.7.6. Signaling Link Bit Rate

**Definition:** The rate at which bits are transmitted over an SS7 signaling link.

**Default Value:**

Signaling Link Bit Rate
56,000 bits per second

**Support:** The AT&T Updated Capacity Cost Study, and an SS7 network industry standard.<sup>39</sup>

#### 4.7.7. Link Occupancy

**Definition:** The fraction of the maximum bit rate that can be sustained on an SS7 signaling link.

**Default Value:**

Link Occupancy
0.40

**Support:** AT&T Updated Capacity Cost Study.<sup>40</sup>

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<sup>38</sup> Brand, et al., "An Updated Study of AT&T's Competitors' Capacity to Absorb Rapid Demand Growth," p. 26.

<sup>39</sup> Brand, et al., "An Updated Study of AT&T's Competitors' Capacity to Absorb Rapid Demand Growth," p. 25.

<sup>40</sup> Brand, et al., "An Updated Study of AT&T's Competitors' Capacity to Absorb Rapid Demand Growth," p. 24.

#### 4.7.8. C Link Cross-Section

**Definition:** The number of C-links in each segment connecting a mated STP pair.

**Default Value:**

C Link Cross-Section
24

**Support:** The input was derived assuming the 56 kbps signaling links between STPs are normally transported in a DS-1 signal, whose capacity is 24 DS-0s.

#### 4.7.9. ISUP Messages per Interoffice BHCA

**Definition:** The number of Integrated Services Digital Network User Part (ISUP) messages associated with each interoffice telephone call attempt. Switches send to each other ISUP messages over the SS7 network to negotiate the establishment of a telephone connection.

**Default Value:**

ISUP messages per interoffice BHCA
6

**Support:** AT&T Updated Capacity Cost Study.<sup>41</sup>

#### 4.7.10. ISUP Message Length, Bytes

**Definition:** The average number of bytes in each ISUP (ISDN User Part) message.

**Default Value:**

ISUP Message Length
25 bytes

**Support:** Bellcore Technical Reference TR-NWT-000317, Appendix A, shows that 25 bytes per message is a conservatively high figure. Northern Telecom's DMS-STP product/service information booklet shows an average ISUP message length of 25 bytes.<sup>42</sup> Therefore a default value of 25 average bytes per message is appropriate for use in the Hatfield Model.

#### 4.7.11. TCAP Messages per Transaction

**Definition:** The number of Transaction Capabilities Application Part (TCAP) messages required per Service Control Point (SCP) database query. A TCAP message is a message between a switch and a

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<sup>41</sup> Brand, et al., "An Updated Study of AT&T's Competitors' Capacity to Absorb Rapid Demand Growth," p. 25.

<sup>42</sup> Northern Telecom, DMS-STP Planner 1995, Product/Service Information, 57005.16, Issue 1, April, 1995, p.13.

database that is necessary to provide the switch with additional information prior to setting up a call or completing a call.

**Default Value:**

TCAP Messages per Transaction
2

**Support:** AT&T Updated Capacity Cost Study.<sup>43</sup>

#### 4.7.12. TCAP Message Length, Bytes

**Definition:** The average length of a TCAP message.

**Default Value:**

TCAP Message Length
100 bytes

**Support:** Bellcore Technical Reference TR-NWT-000317, Appendix A, shows that 100 bytes per message is a conservatively high figure. Northern Telecom's DMS-STP product/service information booklet shows an average TCAP message length of 85 bytes.<sup>44</sup>

#### 4.7.13. Fraction of BHCA Requiring TCAP

**Definition:** The percentage of BHCAs that require a database query, and thus generate TCAP messages.

**Default Value:**

Fraction of BHCA Requiring TCAP
0.10

**Support:** The AT&T Updated Capacity Cost Study assumes that 50% of all calls require a database query, but that is not an appropriate number to use in the HM because a substantial fraction of IXC calls are toll-free (800) calls.<sup>45</sup> When reduced to reflect the fact that a large majority of calls handled by the LECs are local calls that do not require such a database query, the 50% would be less than 10%; Hatfield Associates has used the 10% default as a conservatively high estimate.

#### 4.7.14. SCP Investment per Transaction per Second

**Definition:** The investment in the SCP associated with database queries, or transactions, stated as the investment required per transaction per second. For example, if the default of \$20,000 is assumed, an SCP

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<sup>43</sup> Brand, et al., "An Updated Study of AT&T's Competitors' Capacity to Absorb Rapid Demand Growth," p. 25.

<sup>44</sup> DMS-STP Planner 1995, p.13.

<sup>45</sup> Brand, et al., "An Updated Study of AT&T's Competitors' Capacity to Absorb Rapid Demand Growth," p. 25.

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required to handle 100 transactions per second would require a 2 million dollar (\$20,000 times 100) investment.

**Default Value:**

SCP Investment per Transaction, per Second
\$20,000

**Support:** AT&T Updated Capacity Cost Study uses a default value of \$30,000 from the 1990 study, but notes that this is "conservatively high because of the industry's advances in this area and the resulting decrease in technology costs since the 1990 study."<sup>46</sup> The default value used in the HM represents the judgment of HAI as to the reduction of such processing costs since then.

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<sup>46</sup> Brand, et al., "An Updated Study of AT&T's Competitors' Capacity to Absorb Rapid Demand Growth," p. 27.

#### 4.8. OS AND PUBLIC TELEPHONE

##### 4.8.1. Investment per Operator Position

**Definition:** The investment per computer required for each operator position.

**Default Value:**

Investment per Operator Position
\$6,400

**Support:** Based on AT&T experience in the long distance business.

##### 4.8.2. Maximum Utilization per Position, CCS

**Definition:** The estimated maximum number of CCS that one operator position can handle during the busy hour.

**Default Value:**

Maximum Utilization per Position
32 CCS

**Support:** Industry experience and expertise of Hatfield Associates in conjunction with subject matter experts.

##### 4.8.3. Operator Intervention Factor

**Definition:** The percentage of all operator-assisted calls that require operator intervention, expressed as 1 out of every N calls, where N is the value of the input. Given the default values for operator-assisted calls, this parameter means that 1/10, or 10%, of the assisted calls actually require manual intervention of an operator, as opposed to *automated* operator assistance for credit card verification, etc.

**Default Value:**

Operator Intervention Factor
10

**Support:** Industry experience and expertise of Hatfield Associates.

##### 4.8.4. Public Telephone Equipment Investment per Station

**Definition:** The weighted average cost of a public telephone and pedestal (coin/non-coin and indoor/outdoor).

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Default Value:

Public Telephone Equipment Investment, per Station
\$760

Support: New England Incremental Cost Study.<sup>47</sup>

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<sup>47</sup> New England Telephone Company, "1993 New Hampshire Incremental Cost Study," p. 90.

## 4.9. ICO PARAMETERS

### 4.9.1. ICO STP Investment, per Line

**Definition:** The surrogate value for equivalent per line investment in STPs by a small independent telephone company (ICO), that is used in lieu of calculating it directly in the model.

**Default Value:**

ICO STP Investment per Line
\$5.50

**Support:** The average STP investment per line estimated by the Hatfield Model for all states, with 20 percent added to reflect the higher cost a small ICO is likely to encounter, due to its character of use.

### 4.9.2. ICO Local Tandem Investment, per Line

**Definition:** The surrogate value for the per line investment in a local tandem switch by a small independent telephone company (ICO), that is used in lieu of calculating it directly in the model.

**Default Value:**

Per Line ICO Local Tandem Investment
\$1.90

**Support:** The average local tandem investment per line from the Hatfield Model, with 20 percent added to reflect the higher cost a small ICO is likely to encounter, due to its character of use.

### 4.9.3. ICO OS Tandem Investment, per Line

**Definition:** The surrogate value for the per line investment in an Operator Services tandem switch by a small independent telephone company (ICO), that is used in lieu of calculating it directly in the model.

**Default Value:**

Per Line ICO OS Tandem Investment
\$0.80

**Support:** The average OS tandem investment per line from the Hatfield Model, with 20 percent added to reflect the higher cost a small ICO is likely to encounter, due to its character of use.

### 4.9.4. ICO SCP Investment, per Line

**Definition:** The surrogate value for the per line investment in a SCP by a small independent telephone company (ICO), that is used in lieu of calculating it directly in the model.

**Default Value:**

Per Line ICO SCP Investment
\$2.50

**Support:** The average SCP investment per line from the Hatfield Model, with 20 percent added to reflect the higher cost a small ICO is likely to encounter, due to its character of use.

#### **4.9.5. ICO Local Tandem Wire Center Investment, per Line**

**Definition:** The surrogate value for the per line investment in a local tandem wire center by a small independent telephone company (ICO), that is used in lieu of calculating it directly in the model.

**Default Value:**

Per Line ICO Local Tandem Wire Center Investment
\$2.50

**Support:** The average local tandem wire center investment per line from the Hatfield Model, with 20 percent added to reflect the higher cost a small ICO is likely to encounter, due to its character of use.

#### **4.9.6. ICO OS Tandem Wire Center Investment, per Line**

**Definition:** The surrogate value for the per line investment in a operator services tandem wire center by a small independent telephone company (ICO), that is used in lieu of calculating it directly in the model.

**Default Value:**

Per Line ICO OS Tandem Wire Center Investment
\$1.00

**Support:** The average OS tandem wire center investment per line from the Hatfield Model, with 20 percent added to reflect the higher cost a small ICO is likely to encounter, due to its character of use.

#### **4.9.7. ICO STP/SCP Wire Center Investment, per Line**

**Definition:** The surrogate value for the per line investment in an STP/SCP wire center by a small independent telephone company (ICO), that is used in lieu of calculating it directly in the model.

**Default Value:**

Per Line STP / SCP Wire Center Investment
\$0.40

**Support:** The average STP/SCP wire center investment per line from the Hatfield Model, with 20 percent added to reflect the higher cost a small ICO is likely to encounter, due to its character of use.

#### 4.9.8. ICO C-Link / Tandem A-Link Investment, per Line

**Definition:** The surrogate value for the per line investment in a C-link / tandem A-link by a small independent telephone company (ICO), that is used in lieu of calculating it directly in the model.

**Default Value:**

Per Line ICO C-Link / Tandem A-Link Investment
\$0.30

**Support:** The average C-Link / tandem A-link investment per line from the Hatfield Model, with 20 percent added to reflect the higher cost a small ICO is likely to encounter, due to its character of use.

## 5. EXPENSE

### 5.1. COST OF CAPITAL AND CAPITAL STRUCTURE

**Definition:** The capital cost structure, including the debt/equity ratio, cost of debt, and return on equity, that make up the overall cost of capital.

**Default Values:**

Cost of Capital	
Debt percent	0.450
Cost of debt	0.077
Cost of equity	0.119
Weighted average cost of capital	0.1001

**Support:** Based on FCC-approved cost of capital methodology using 1996 financial data and AT&T and MCI-sponsored DCF and CAPM analyses calculating the RBOCs' cost of capital. See, for example, "Statement of Matthew I. Kahal Concerning Cost of Capital," In the Matter of Rate of Return Prescription for Local Exchange Carriers," File No. AAD95-172, March 11, 1996. See also AT&T ex parte filing of February 12, 1997, "Estimating the Cost of Capital of Local Telephone Companies for the Provision of Network Elements," by Bradford Cornell, September, 1996.

## 5.2. DEPRECIATION AND NET SALVAGE

**Definition:** The economic life of various network plant categories.

**Default Values:**

Plant Type	Economic Life	Net Salvage %
motor vehicles	8.24	11.21
garage work equipment	12.22	-10.71
other work equipment	13.04	3.21
buildings	46.93	1.87
furniture	15.92	6.88
office support equipment	10.78	6.91
company comm. Equipment	7.40	3.76
general purpose computers	6.12	3.73
digital electronic switching	16.17	2.97
operator systems	9.41	-0.82
digital circuit equipment	10.24	-1.69
public telephone term. Equipment	7.60	7.97
poles	30.25	-89.98
aerial cable, metallic	20.61	-23.03
aerial cable, non metallic	26.14	-17.53
underground cable, metallic	25.00	-18.26
underground cable, non metallic	26.45	-14.58
buried cable, metallic	21.57	-8.39
buried cable, non metallic	25.91	-8.58
intrabuilding cable, metallic	18.18	-15.74
intrabuilding cable, non metallic	26.11	-10.52
conduit systems	56.19	-10.34

**Support:** The default values are the weighted average set of projected depreciation lives, and net salvage percentages, coming from 76 LEC study areas including all the BOCs, SNET, Cincinnati Bell, and numerous GTE and United companies. Weighting is based on total lines per operating company. The projected lives and salvage values are determined in a triennial review process involving each state PUC, the FCC, and the LEC to establish unique state-and-operating-company-specific depreciation schedules. See, FCC Public Notice D.A. #'s 95-1635, 93-970, 96-1175, 94-856, 95-1712. NID and SAI lives are calculated as the average life of metallic cable, since lives are not separately specified for those plant categories and they are classified as outside plant.

### 5.3. STRUCTURE SHARING FRACTION

**Definition:** The fraction of investment in distribution and feeder poles and trenching that is assigned to LECs. The remainder is attributed to other utilities/carriers.

**Default Values:**

Structure Percent Assigned to Telephone Company						
Density Zone	Distribution			Feeder		
	Aerial	Buried	Underground	Aerial	Buried	Underground
0-5	.50	.33	1.00	.50	.40	.50
5-100	.33	.33	.50	.33	.40	.50
100-200	.25	.33	.50	.25	.40	.40
200-650	.25	.33	.50	.25	.40	.33
650-850	.25	.33	.40	.25	.40	.33
850-2,550	.25	.33	.33	.25	.40	.33
2,550-5,000	.25	.33	.33	.25	.40	.33
5,000-10,000	.25	.33	.33	.25	.40	.33
10,000+	.25	.33	.33	.25	.40	.33

**Support:** Industry experience and expertise of Hatfield Associates and outside plant engineers; Montgomery County, MD Subdivision Regulations Policy Relating to Grants of Location for New Conduit Network for the Provision of Commercial Telecommunications Services; Monthly Financial Statements of the Southern California Joint Pole Committee; Conversations with representatives of local utility companies. See the structure sharing discussion in Appendix B.

## 5.4. OTHER EXPENSE INPUTS

### 5.4.1. Income Tax Rate

**Definition:** The composite federal and state income tax rate on earnings paid by a telephone company.

**Default Value:**

Income Tax Rate
39.25%

**Support:** Based on a nationwide average of composite federal and state tax rates.

### 5.4.2. Corporate Overhead Factor

**Definition:** Forward-looking corporate overhead costs, expressed as a fraction of the sum of all capital costs and operations expenses calculated by the model.

**Default Value:**

Overhead Factor
10.4%

**Support:** Based on data from AT&T's Form M. See, also earlier ex parte submission by AT&T dated March 18, 1997 and Appendix C.

### 5.4.3. Other Taxes Factor

**Definition:** Operating taxes (primarily gross receipts and property taxes) paid by a telephone company in addition to federal and state income taxes.

**Default Value:**

Other Taxes Factor
5%

**Support:** This is the average for all Tier I LECs, expressed as a percentage of total revenue. Revenue and tax data are taken from ARMIS report 43-03. See, also Appendix B.

### 5.4.4. Billing/Bill Inquiry per Line per Month

**Definition:**

The cost of bill generation and billing inquiries for end users, expressed as an amount per line per month.

**Default Value:**

Billing / Bill Inquiry per line per month
\$1.22